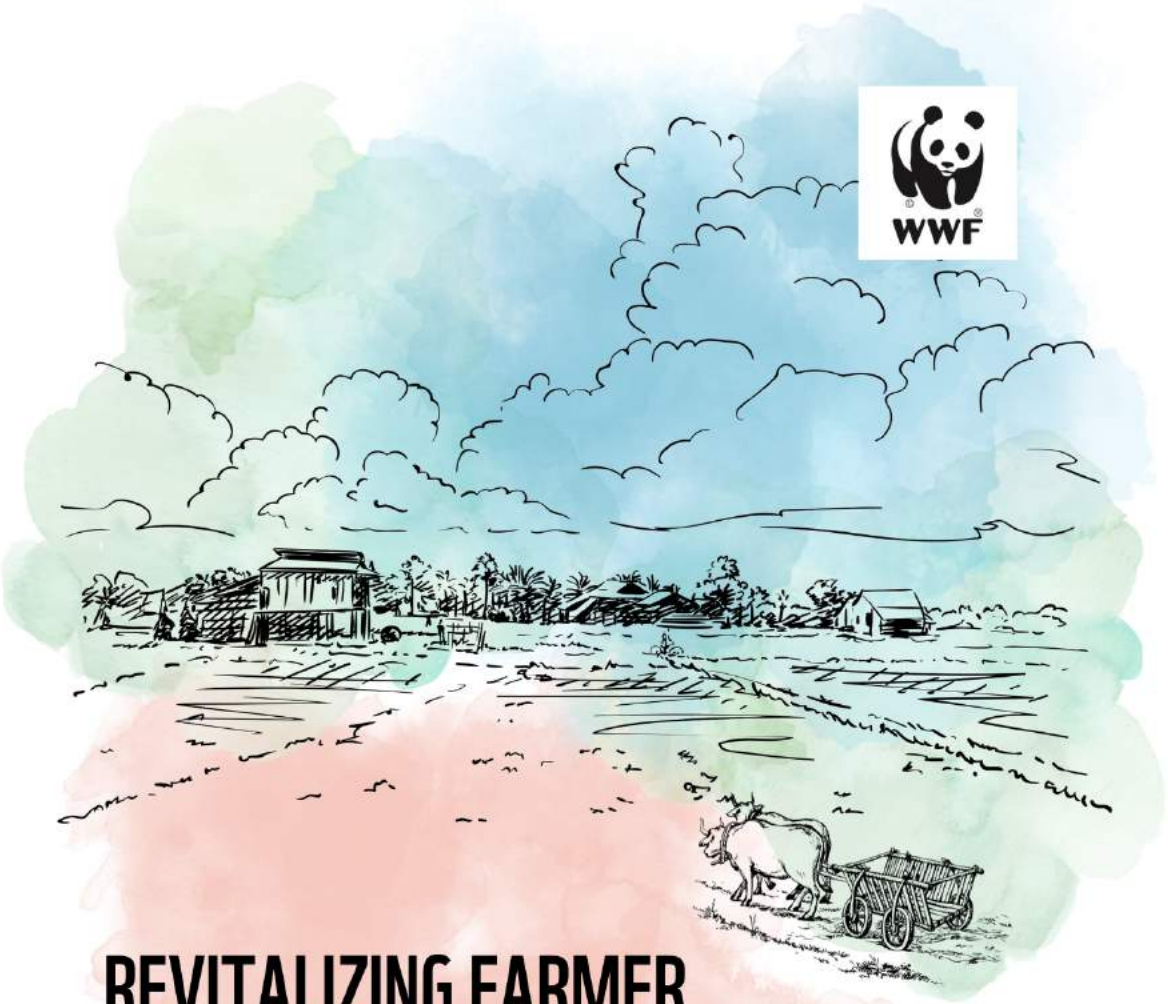

REVITALIZING FARMER MANAGED NATURAL REGENERATION IN MYANMAR

STUDY-BASED REPORT FOR WWF-MYANMAR

Supported by:

Federal Ministry
for the Environment, Nature Conservation
and Nuclear Safety

based on a decision of the German Bundestag

Acknowledgements

Consultants: Daw Moe Moe, Dr. Tin Moe Khaing and Dr. Nan Zarchi Win
Editors: Daniel Thomas and Andrea Austin
Layout: WWF-Myanmar

Contact:

WWF-Myanmar: mm.info@wwf.org.mm

September 2022

Table of Contents

List of tables

List of figures

List of acronyms

CBOs	Community-based organizations
CDZ	Central Dry Zone
CEDA	Central Environmental Development Association
CF	Community forestry
CSOs	Civil society organizations
DALMS	Department of Agriculture Land Management and Statistics
DEAR Myanmar	Development for Environmental-friendly Agriculture and Rural Life of Myanmar
DZGD	Dry Zone Greening Department
FGD	Focus group discussion
FMNR	Farmer managed natural regeneration
GAD	General Administration Department
GDP	Gross domestic product
IEC	Information, education and communication
IELEM	Improve Economic Livelihood and Environmental Management
IGAs	Income generation activities
INGOs	International non-governmental organizations
ITC	Information technology and communication
KCWG	Kachin Conservation Working Group
KKBA	Kehko Kehbah Karen Baptist Association
LNGOs	Local gon-Governmental organizations
MADB	Myanmar Agriculture Development Bank
MENHO	Myitphya Eyar Natural and Heritage Organization
MERN	Myanmar Environment Rehabilitation-Conservation Network
MOALI	Ministry of Agriculture, Livestock, and Irrigation
MONREC	Ministry of Natural Resources and Environmental Conservation
MRRP	Myanmar Reforestation and Rehabilitation Programme
NGOs	Non-governmental organizations
NR	Natural regeneration
OISCA	Agriculture and Rural Development Training Centre
POINT	Promotion of Indigenous and Nature Together
REAM	Renewable Energy Association Myanmar
RFDA	Regional Farmer Development Association
RSSDO	Rakhine Strengthening Social Development Organization
WVM	World Vision Myanmar
WWF	World Wildlife Fund
YSA	Youth Strength Association

Executive Summary

Forest resources play a critical role in supporting the livelihoods of Myanmar's people and the national economy. However, as in many countries and regions around the world, forests in Myanmar are increasingly threatened by a wide range of pressures, including deforestation, land-use change, agricultural expansion, invasive alien species, severe droughts and wildfire. Myanmar, like many developing countries, is encountering high population growth and development pressures, making the challenge to effectively manage forests on a truly sound and sustainable basis particularly urgent.

Myanmar's Central Dry Zone (CDZ) is poor in natural resources and particularly vulnerable to development pressures and climate change. It is characterized by water scarcity, thin vegetation and land degraded by erosion – factors that are increasingly compounding already precarious food security, urban migration and climate risks.

Farmer Managed Natural Regeneration (FMNR) is a sustainable method for restoring forest and agricultural land and for reversing land degradation in regions such as the CDZ. FMNR is a low-cost, high-impact land restoration technique that was first developed in Niger by Tony Rinaudo of World Vision, who is the original architect and foremost expert of this uncomplicated yet powerful technology. The approach is now implemented in at least 24 countries worldwide. FMNR has proven to be a highly effective and scalable farmer-managed technique that can be used to counteract soil

erosion and fertility loss, deforestation and biodiversity loss. It also addresses some of the underlying causes of flood, drought and food insecurity.

In practice, FMNR is a simple technology for identifying viable trees and stumps, pruning them to maximize healthy growth, and then protecting them from threats such as grazing cattle, theft or fire. Because it is based on community participation and uses already-available resources, it is low cost, easy to manage and has proved effective in many regions throughout the world. By practising FMNR, communities can restore their land, increase their productivity and build resilience. FMNR improves soil fertility, prevents erosion and helps to mitigate climate change. In parallel, FMNR also fosters community empowerment practices and strengthens people's relationships with the environment.

WWF-Myanmar is exploring the possibility of developing FMNR in Myanmar on a large-scale and a long-term basis with partner organizations. As part of this process, WWF-Myanmar has conducted this study in order to understand the current state of FMNR in the country; how it is perceived by local communities; its implementation challenges; and potential benefits. The intention of this study is to collect and condense this data into actionable information that can inform and encourage a substantive FMNR project in the country. WWF-Myanmar's ambition is for such a project to serve as a springboard towards greater dissemination of the technique in Myanmar.

World Vision Myanmar (WVM) has been the pioneer in developing FMNR in Myanmar, and has already worked in numerous villages to implement FMNR on communal land. WWF-Myanmar has conducted surveys in these villages, assessing the perception and impact of the technique. It also plans to include villages with experience of FMNR in its own pilot project, conducting exchange visits in which stakeholders from villages with successful track records with FMNR visit new target villages that are considering adopting the practice.

WWF-Myanmar's initial analysis has indicated that FMNR has had a positive impact on communities and local ecosystems in areas in Myanmar where it is already established. FMNR has the potential to deliver transformational impact for smallholder farmers and other groups in Myanmar, while significantly improving the natural environment and ecosystems where it is implemented. WWF-Myanmar's field study data strongly indicates that some villages and families are already enthusiastic about FMNR as a result of the positive outcomes it has brought, whereas some villages experienced failure and stopped practising FMNR due to various reasons and challenges. The economic benefits that FMNR brings do not happen quickly and this can dissuade communities from fully embracing the practice in the long term.

In order for FMNR to spread and take hold in Myanmar on a substantial scale, creating enabling factors is essential. Enabling factors include policy change, civil society organization (CSO) participation, linking FMNR promotion to short-term income

generating activities, and improving IT and communication technology and the capacity of implementing staff.

In addition, WWF-Myanmar's FMNR study produced data that has informed key recommendations for launching an FMNR project in the country:

Recommended short-term actions and considerations:

- Find partners to begin implementing FMNR, selected for their suitability and relevant track record.
- Develop and distribute information, education and communication (IEC) materials and FMNR manuals in Burmese to key potential stakeholders.
- Focus pilot projects in villages that have already worked with WVM.
- Conduct exchange visits between villages that have successfully implemented FMNR and those considering it in order to share experiences and lessons learned.
- Expand FMNR training to include technical training on other improved agricultural practices, as well as land tenure and ownership policies.
- Establish demonstration plots and simple trials for FMNR in farmlands .
- Organize study trips for those interested in FMNR, including exchange trips and experience-sharing events to promote networking and collaboration.
- Establish effective rules and regulations. It is strongly suggested that FMNR should be complemented with other income generation activities (IGA) and livelihood activities. This would ensure greater success and facilitate long-term and sustainable adoption.

Recommended long-term actions and considerations:

- Collect baseline data and information before and after the project intervention period. This should include livelihood status, climatic conditions, tree density, the number of species (both flora and fauna), greening areas, and before and after pictures. Data can be collected from many sources such as: amount of firewood harvested, fodder and grain yields, wild foods collected, soil fertility, water table recharge and temperatures. While it may not be feasible to collect data on all of these aspects all the time, FMNR implementing staff should select variables and indicators that provide valuable information that is of use to the project, and those of greatest interest to the community.
- Facilitate collaboration between all key stakeholders, such as village administrators, community-based organizations (CBOs), non-governmental organizations (NGOs), and relevant resource providers and facilitators.
- Establish a lead working group or committee within communities to support organization and leadership. In the villages studied, CBOs had been established, though FMNR was understandably not their main focus.
- Conduct awareness-raising workshops to sensitize the community and promote commitment.

Key observations from field research:

Field study data shows there is significant positive impact where there is strong community participation. FMNR technology is much appreciated by local communities in Myanmar's CDZ. However, the lack of adequate awareness-raising and lobbying activities has hindered the widespread adoption of FMNR technology in the region, even though FMNR's potential is widely recognized. Lack of FMNR committees and future sustainability plans, land tenure issues, and free range livestock grazing practices are the main reasons why FMNR has not become more widely established in the majority of villages in the study area.

Strong leadership and organizational skills in an individual community leader are essential to successfully adopting and achieving FMNR practices. The role of religious leaders, especially monks based in villages, is imperative because they often guide and lead community members to follow FMNR and can educate others on the importance of trees and forests.

1. Introduction

1.1 Background of the study

Myanmar has rich natural resources, including forests that are diverse and varied in composition and structure. Its forests are a valuable ecosystem spread widely throughout the country, across different topographies and various climatic conditions. According to the Global Forest Resources Assessment (2020), Myanmar has a forest cover of 42.19 per cent of the country's total area. Conservation of forest resources and ecosystems in Myanmar is crucial for many reasons, not least because the accelerating impact of climate change and natural disasters threatens the livelihoods and socio-economic development of Myanmar's people. Forests can provide a wide range of ecosystem services, climate change mitigation and other benefits including biodiversity richness, soil and water resources, and non-timber forest products (NTFPs) for local communities. As a result, forest cover in the country is socially and economically significant for sustainable development.

Agriculture is a critical sector in Myanmar; together with the forestry and fishery sectors, it was an estimated 25 per cent of the country's GDP in 2020, with agriculture employing about 50 per cent of the workforce.[1] Eighty per cent of farmers are smallholders who work on half of the croplands in the country. Due to extensive outward migration in the

[1] World Vision, 2019

study areas, smallholder farmers often need to contract labour from outside their family units. This creates job opportunities for landless households.

Myanmar has a diverse ethnic population of approximately 51.5 million, 70 per cent of whom live in rural areas. They depend highly on forest resources for basic needs such as food, fodder, fuel and shelter. Forest resources play a critical role in supporting the livelihoods of Myanmar's people and its economy.

Nevertheless, forests are increasingly threatened by a wide range of pressures, including deforestation, land-use change, agricultural expansion, invasive alien species, severe droughts and wildfires. The challenge to effectively manage forests on a truly sound and sustainable basis has been particularly urgent in Myanmar, which like many other developing countries, is encountering high population and development pressures. Despite the extensive pressures and high dependency on forests in Myanmar, the considerable extent of natural forests in the country is an indication of the consistent exercise of historically sound forest management practices.[2]

The CDZ covers 12 per cent of the total land area of the country. It is affected by very harsh climatic conditions with extreme temperatures, prolonged periods of drought and erratic rainfall. In order to rehabilitate and green the CDZ, the government launched the Nine District Special Greening Project in 1994. With the success and experiences of that project, the government established the Dry Zone Greening Department (DZGD) in 1997 to manage reforestation in the CDZ. The department covered 7.91 million hectares (ha) in 53 townships under 13 districts across three regions. The main objective of the DZGD was to develop a 30-year plan, beginning in 2001, to protect and preserve remaining natural forests and to establish forest plantations. The plan also promoted the use of fuelwood substitutes and the development of water resources. The Forest Department and DZGD have been cooperating and implementing the Myanmar Reforestation and Rehabilitation Programme (MRRP) together since 2017 to restore and rehabilitate the degraded forests in 68 districts across 15 states and regions. The project is slated to last until 2027.

Due to the critical role of forest resources in supporting Myanmar's people and national economy, reliable information on the extent, composition and density of forests is very important for sustainable development.[3] Among forest management practices, community-based forest management is the most effective and sustainable approach for preserving and reestablishing forest cover.

FMNR is a highly effective approach for restoring forest cover, with a demonstrated, successful global track record across a wide range of countries and topographies. The technique is a low-cost, easy to implement, simple, sustainable land regeneration practice that communities can use to restore their land, increase their productivity and build resilience relatively quickly and efficiently. It includes not only tree management

[2] Forestry in Myanmar 2020
[3] FAO 2020

practices involving selection, pruning, protection and maintenance, but also community empowerment practices by 're-greening' both community mindsets and people's relationships to nature and their landscape. Importantly, the study has shown that the practice can be successfully integrated into existing community forestry (CF) practices in Myanmar.

Based on these aspirations, WWF-Myanmar carried out this study to explore the feasibility of rapidly scaling up FMNR in Myanmar. The terms of reference were published in October 2021 and a survey was conducted in Yenangyaung and Chauk townships where WVM had implemented FMNR under two projects, "Improving Livelihood Status through Capable Community-Based Organization, 2010-2012", and "Improve Economic Livelihood and Environmental Management" for 2014-2018.

1.2 Objectives of the study

The objectives of this study are to inform a roadmap for the implementation of FMNR in Myanmar. The study sought to answer the following key questions:

1. What is the current state of FMNR in Myanmar?

2. Who are the stakeholders for FMNR in Myanmar?

3. What are the opportunities and challenges in developing FMNR in Myanmar?

4. What should WWF-Myanmar's goals be for FMNR in Myanmar, considering

our large-scale and long-term aspirations, and taking into account (1), (2) and (3)?

5. What key hurdles must WWF-Myanmar overcome to achieve the goals determined in (4)?

2. Research Methodology

The study was conducted in Yenangyaung and Chauk townships in the Magway region, located in Myanmar's CDZ. It was carried out with a descriptive research design that combined qualitative and quantitative methods of data collection and analysis.

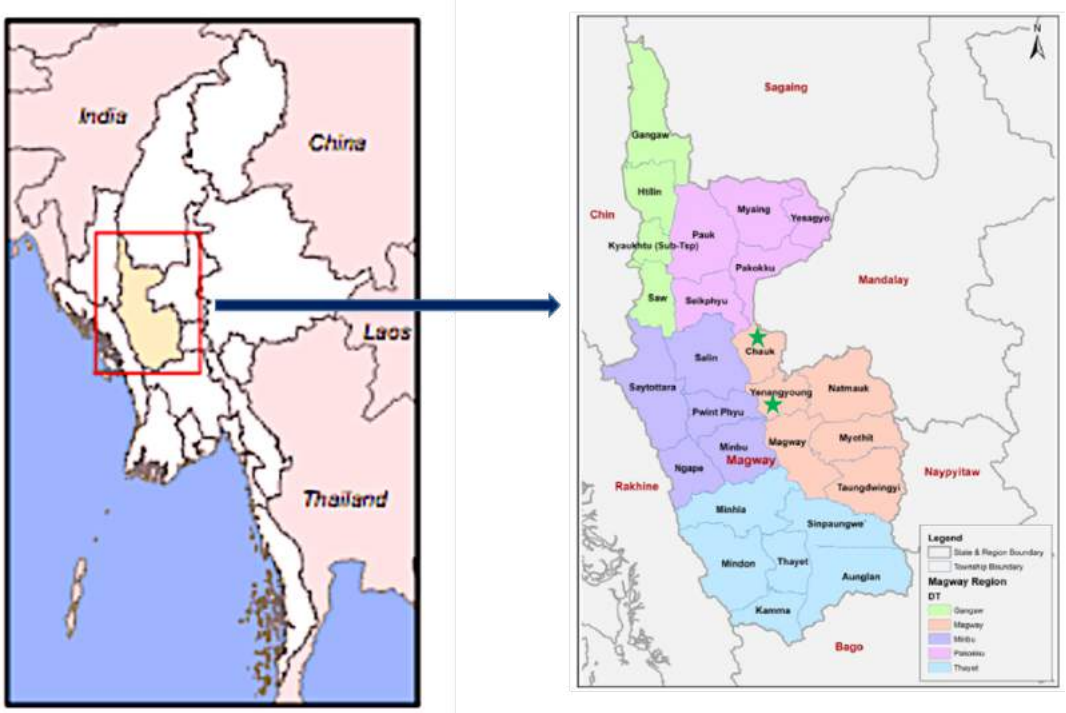

Figure 1. Map of Magway region and the study area

2.1 Desk review

The consultants reviewed existing literature comprising publications and documents on FMNR practices in different countries, and relevant laws and policies released from government departments, NGOs and UN agencies. Subsequently, the preparation of questionnaires and planning of data collection was developed in consultation with WWF-Myanmar project team members.

2.2 Field survey

The field-level survey included quantitative and qualitative data collection in selected villages. For quantitative data, face-to-face interviews were conducted with one representative household member, using an electronic data collection tool (Kobo collect). For qualitative data collection, focus group discussions (FGD) with farmers were conducted to understand their perception of a broad set of benefits and challenges associated with FMNR. Moreover, in-depth interviews and key informant interviews (KII) with community leaders, CBOs and WVM representatives were conducted to elicit

explanations and elaborations for quantitative data analyses, and to formulate recommendations for the project.

A total of 14 villages were selected based on their track record of implementing FMNR and their geographical location; seven villages from Yenangyaung township: Kyun Chaung Lay, Yone Kone, War Yoe, Sein Pan Pin, Ah Lae Kan, Kone Eaint and Kyun Chaung Gyi; and seven villages from Chauk township: Thar Yar Kone, Na Ywe Taw, Kan Thit Kone, Ka Tine (N), Kyo Pin, Kine Htauk Kan and Larbawaddy.

The consultant team also visited Leik Kan in Magway township, Kan Swel in Salin township, Kan Phyu in Kyaukpadaung township and Lin Ta Kine in Chauk township, all of which were non-FMNR implementing villages. The aim of these visits was to assess local awareness and attitudes towards FMNR.

The number of sample respondents and interview type is set out in Table 1. In addition, stories from FMNR farmers were recorded to understand the level of success that FMNR has achieved. Direct observations were also made during the field visits to assess the conditions of land where FMNR has been implemented.

Township	No. of villages	No. of respondents for household interviews	No. of FGD	Respondents in FGD	Community/ farmer leaders	NGOs/CSOs / CBOs/Farmer orgs.	Forest technicians	External Experts	Other stakeholders
Yenangyaung	**7**	70	7	74	5	4			
Chauk	7	70	7	79	5	4			
Salin	1	8	1	7		-			
Kyaukpadaung	1	8	1	18		-			
Magway	1	8	1	12		2			
Yangon						1	2	1	3
Total		**164**		**190**	**10**	**11**	**2**	**1**	**3**

Table 1. Study sample respondents

2.3 FMNR orientation workshop

An orientation workshop for FMNR stakeholders was held on 14 December 2021, organized by the WWF-Myanmar and consultant teams using the Zoom application. The principal objectives of the workshop were to introduce FMNR practices, record experiences of FMNR's current implementation in Myanmar, and to explore the possibilities of future collaboration on generating an FMNR movement in the country. A total of 36 participants attended the workshop, which included representatives from INGOs (WVM), LNGOs, CSOs, CBOs, the Myanmar Forest Association, a regional farmer development association, retired professors from the University of Forestry and Environmental Science and Yezin Agricultural University, and delegates from WWF-Myanmar.

2.4 Study limitations

Some limiting factors may have affected the results of the consultant team's research. Due to time limitations, the current political and security situation, and COVID-19 restrictions, the consultants were not able to visit many targeted villages or to directly observe how FMNR has been implemented in those villages. As a result of political instability and the security situation, some of the sample villages initially identified for the study had to be replaced.

The consultant team was also not able to conduct interviews with government officials from relevant line departments. Additionally, opportunities to secure proper data and information such as reports and figures related to FMNR in Myanmar were also limited. Despite these limitations, the study was able to capture highly relevant information in prospective target areas for a potential WWF-Myanmar FMNR program; information and insights gathered through the study has allowed WWF-Myanmar to build a more informed understanding of the current status of FMNR in the country, including its successes, constraints, the plant species involved, community perceptions and participation, and the wider benefits practising FMNR can bring.

3. Findings and Implications

3.1 Overview of FMNR in the study areas

The CDZ is one of the regions in Myanmar most vulnerable to climate change, and has relatively poor natural resources. It is characterized by water scarcity, thin vegetation, and land that has been degraded by erosion. FMNR can address land degradation problems as it helps to develop soil fertility and prevents erosion. FMNR is considered one of the more appropriate practices for repairing degraded agricultural land in a dryland farming system.[4]

FMNR technology itself is very simple and is comprised of three basic steps:

Step 1: Farmers select desired tree stumps and for each stump select a few of the tallest and straightest stems to maintain.

Step 2: Remove the unwanted stems and side branches. Manage any threats to remaining branches from livestock, fire, and competition for nutrients and water (such as weeds).

Step 3: Cull emerging new stems and periodically prune side branches.

Although limited, the practice of FMNR in the study areas has demonstrated how it can generate positive impacts for communities and facilitate reforestation in the CDZ. During field visits, WWF-Myanmar's research team has experienced first-hand the benefits of implementing FMNR in the study areas. The number of forest trees has significantly increased, and communal forests are becoming dense with re-greening after a decade of dedicated care.

It is important to note the challenges and constraints that affect FMNR adoption among rural people – no matter the potential benefits of the technology – as successfully leveraging FMNR relies on effective community participation and understanding. During field study trips, the research team repeatedly found that some villages and families are satisfied with FMNR as a result of its positive outcomes, while other villages experienced failure and stopped practising FMNR.

In the areas studied, about 60 per cent of farmers had adopted FMNR practices. Of the 40 per cent that did not, farmers cited multiple challenges in following FMNR practices. These include lack of time (22 per cent), difficulty in finding labour (20 per cent), farmers' unwillingness to change established practices (16 per cent), shortage of suitable land (11 per cent), lack of knowledge (9 per cent), distance from their house (9 per cent), and tree tenure security problems (7 per cent).

[4] Weston et al. 2015

Around 29 tree species were found in all the FMNR-participating villages, and these are all naturally regenerating species that are well established in the project areas. A full list of tree species found in the study areas is included in the Annex of this report.

WVM's pioneering role with FMNR in Myanmar

In Myanmar, it is important to recognize that World Vision Myanmar (WVM) is the forerunner organization in implementing FMNR. Tony Rinaudo first introduced the technique to the organization's Yenangyaung and Chauk Area Development Programme in the CDZ in 2010. Through his technical support, including education in FMNR concepts and practical field training, FMNR techniques spread among local farmers and communities in the CDZ by word of mouth.

FMNR was then implemented through an integrated component under WVM's "Improving Livelihood Status through Capable Community Based Organization Project" in 30 villages in Chauk and Yenangyaung townships between 2010 and 2012. Then, between 2014 and 2018, FMNR implementation was continued as part of WVM's "Improve Economic Livelihood and Environmental Management project (IELEM)" in 26 villages in Chauk and Yenangyaung.

FMNR practices are simple, user-friendly and appropriate techniques for dry zone areas, and easy to apply in the field. However, compared to other countries where FMNR has been rolled out through concerted, long-term programs, the adoption and diffusion rate in Myanmar is significantly lagging.

This is due largely to the lack of adequate implementation support activities, such as training sessions, seminars and community mobilization events. Because FMNR was a small component of WVM's massive development program, it has not yet had the opportunity to take hold in a substantive way in the country and has so far not received the same kind of attention as other areas such as health, education and livelihood improvement.

Socio-demographic data of respondents

Table 2 shows the demographic characteristics of the survey respondents. Regarding the gender of respondents, 36 per cent of respondents were female heads of household while the majority (81 per cent) were male. In accordance with the general pattern in Myanmar, the designated male head of household is the socio-demographic norm in the study area.

Descriptions	**Percent**
Gender	
Male	64%
Female	36%
Gender of household head	
Male	81%
Female	19%

Status in household	
Household Head	69%
Wife	19%
Others	12%
Age	
18-30	9%
31-40	12%
41-50	24%
51-60	30%
61-70	22%
>=71	4%
Education levels	
Illiterate	1%
Semi-literate	6%
Primary School	44%
Secondary School	31%
High School	16%
Graduate	1%
Family size	
1-3 members	24%
4-6 members	56%
7-9 members	16%
10-12 members	4%

Table 2. Socio-demographic data of respondents

The highest proportion of respondents were 51-60 years old (30 per cent), followed by 41-50 years old (24 per cent) and 61-70 years old (22 per cent). Only 9 per cent and 12 per cent of respondents were 18-30 and 31-40 years old, respectively. The data shows that youth participation was very low in the survey, likely as a result of large numbers of young people migrating from the CDZ to search for work in urban centres.

Regarding literacy levels, 44 per cent had reached primary school, 31 per cent secondary school, and 16 per cent high school, while only 7 per cent had either limited or no reading and writing skills.

As most respondents have relatively high levels of basic education, it is possible to conduct capacity building activities such as training and local community workshops.

The majority (56 per cent) of households in the study area are composed of 4-6 members, a figure that is consistent with Myanmar's 2014 Population and Housing Census.

Most of the respondents (80 per cent) earn their income through agriculture, while 24 per cent raise livestock (Figure 2). Approximately 26 per cent of respondents earn their income as casual labourers. Some of the respondents were landless households, and others were farmers with small land holdings.

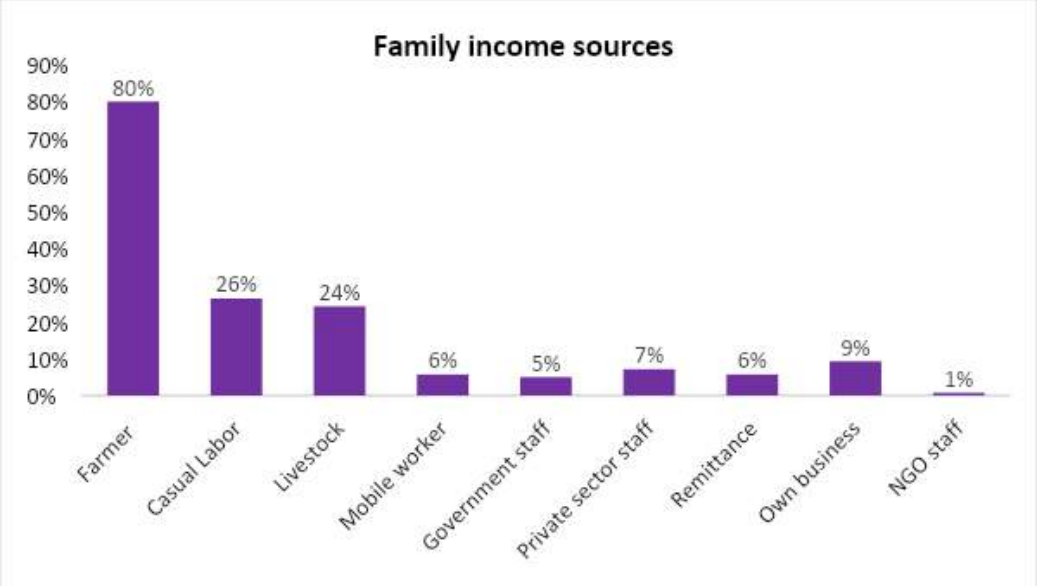

Figure 2. Sources of income of the sample respondents

In terms of land ownership, the majority of respondents (81 per cent) owned land for farming while 19 per cent were landless households (Table 3). The majority of the respondents (44 per cent) owned land holdings of 2-4 ha and the second highest proportion of respondents (35 per cent) had less than 2 ha. A very small proportion of respondents (3 per cent) had land holdings of more than 8 ha.

Description	**Percent**
Land Ownership	
Own the land	81%
Seasonal Rent	2%
Short term (1 -2 years) rent	1%
Long term (> 5 years) rent	1%
Mortgage land	5%
Do not own land	19%
Land holding size	
<2 ha	35%
2-4 ha	44%
4.5-6.1 ha	10%
6.5-8.1 ha	8%
>8.1 ha	3%

Table 3. Land ownership and land holding size of sample respondents

Farmers in the study areas also earn income from their plantations or from perennial crops such as toddy plum and jujube. Based on the survey results, around 37 per cent of farmers own toddy plum trees, 29 per cent have jujube trees and 16 per cent have mango trees.

Financing

According to the households interviewed, 23 per cent claimed that they did not take out any loans for farming (Figure 3). The 77 per cent who have access to financing mostly use the Myanmar Agricultural Development Bank (MADB), microfinance and informal lenders like friends and relatives (Figure 4).

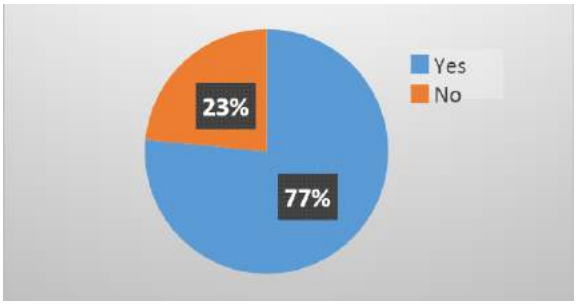

Figure 3. Per cent of farmers who receive loans or credit for farming

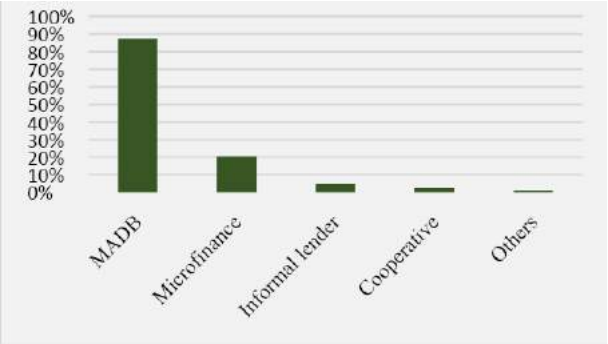

Figure 4. Sources of loans or credit for farmers in the study areas

Adoption of FMNR in the study areas

The results of the study show that about 80 per cent of respondents practise FMNR while another 20 per cent do not integrate FMNR in their farming activities. Among those practising FMNR, 51 per cent applied the technique on communal land, while 33 per cent used FMNR on both communal and their own private land. Another 16 per cent of farmers only use FMNR on private land.

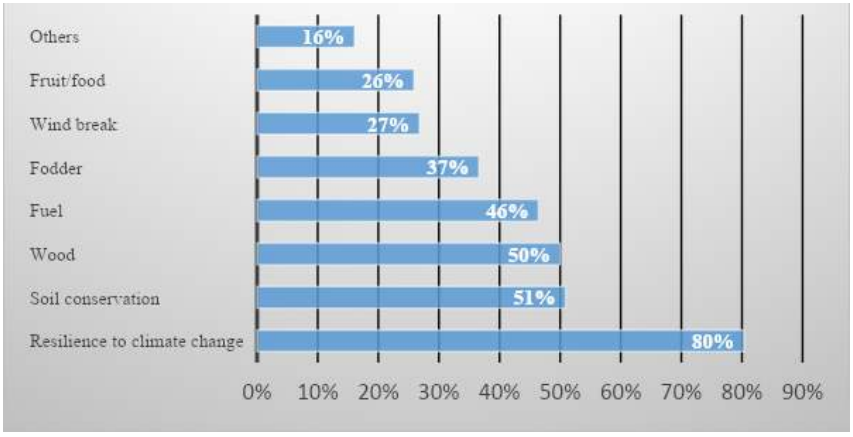

Figure 5. Reasons for practising FMNR in study areas

The reasons for practising FMNR provided by respondents are quite interesting, diverse and pragmatic. Respondents have observed that trees are good for the environment, particularly in mitigating the impacts of climate change and building resilience. Respondents also highlighted that FMNR is useful for soil conservation. In addition, they noted that accessibility to wood for construction and farming tools has improved through the use of FMNR; indeed, the improved availability of firewood from pruned tree branches is a key driver of FMNR in study areas, Pruned tree branches also provide fodder for livestock. Furthermore, study participants observed that increased tree density has resulted in less crop loss from windstorms. Detailed reasons for practising FMNR are described in Figure 5.

Regarding their perception of FMNR's effect on agricultural yields, most of the respondents (72 per cent) believed that FMNR would not directly increase crop yields, but would improve them indirectly by improving soil fertility and moisture content, and by providing a favourable climate in the area in the long term. Approximately one-quarter of respondents (26 per cent) insisted that there is probably no effect on crop yields due to FMNR. A few respondents (2 per cent) believed that FMNR reduced crop yields due to the effect of shade on crops (Figure 6).

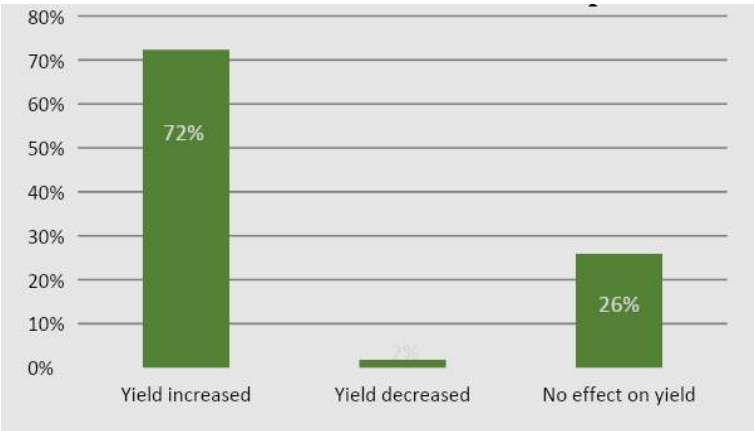

Figure 6. Perceptions of FMNR's effect on crop yields

Understanding the perceived challenges to practising FMNR is key to promoting the technology. Although the highest proportion of respondents stated that they were able to practise FMNR without any challenges, Figure 7 shows that those who cited challenges listed lack of time (22 per cent), lack of labour (20 per cent), established habits (16 per cent), shortage of suitable land (11 per cent), lack of knowledge (9 per cent), distance from home (9 per cent) and tree tenure insecurity (7 per cent).

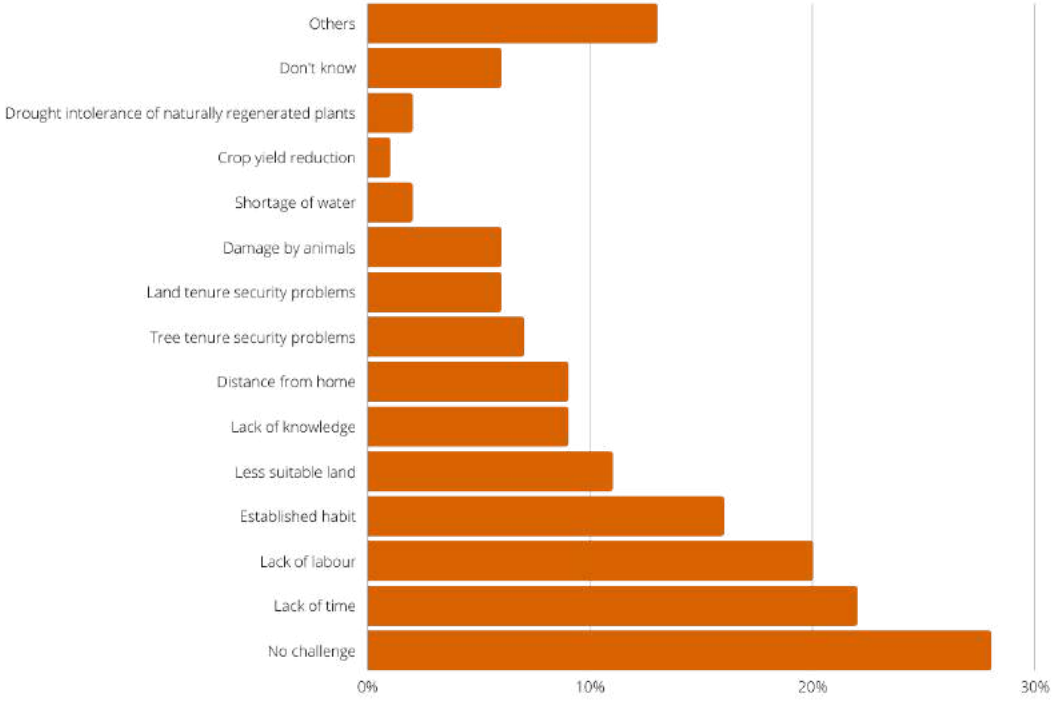

Figure 7. Challenges of practising FMNR

Figure 8 shows that in order to sustain FMNR in the region, the greatest proportion of respondents asked for technical support such as training (40 per cent) followed by financial support (36 per cent) and materials such as knives (27 per cent). Other supports sought by respondents include the formation of a functioning FMNR group to lead activities with proper rules and regulations to protect FMNR landscapes (*For more details on financing related to FMNR, please see* Section 6.4.)

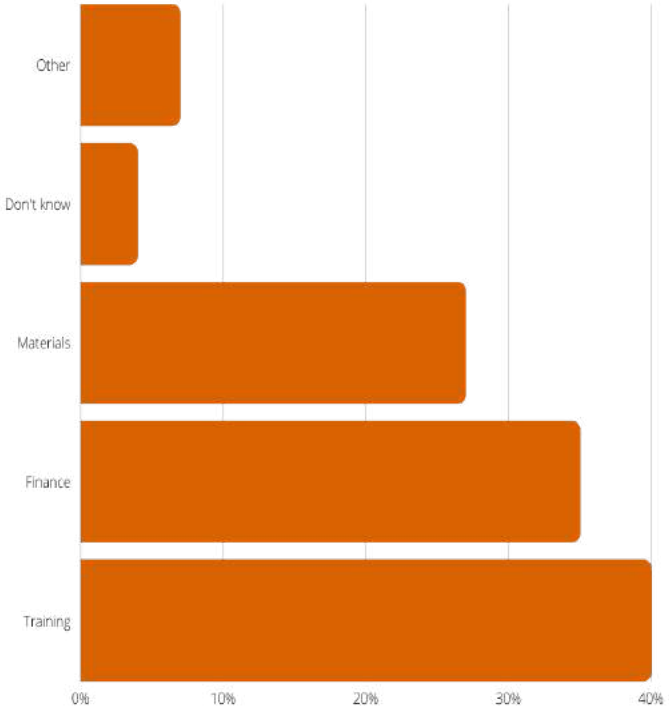

Figure 8. Supports needed to sustain/practise FMNR

Cropping patterns of the study areas

Due to its geographical and agro-climatic conditions, lowland crops are not found extensively in the study areas. Upland cropping systems and crops are totally dominant throughout the year. During the summer, most villages do not cultivate any crops, with the exception of groundnut, which serves as a frequent component of intercropping systems.

Monsoon season (May-September) crops: Groundnut is a main monsoon season crop and is harvested twice as early monsoon and late monsoon varieties. According to survey results, 84 per cent and 95 per cent of farmers in Yenangyaung and Chauk townships respectively answered that sesame is also a main cash crop for smallholder farmers, and the study area was previously known for sesame production. However, the cropping pattern has gradually changed. Study respondents have expressed that growing sesame has become challenging or impossible due to extreme drought and unusual rainfall patterns. Most of the farmers in Yenangyaung township (68 per cent) cultivate sesame, however, only 14 per cent of farmers in Chauk township can do so. The other promising crop in the study areas is pigeon pea as it is cultivated by 38 per cent and 27 per cent of farmers in Yenangyaung and Chauk townships, respectively.

Crops	Yenangyaung	Chauk
Groundnut (early monsoon)	84%	95%
Sesame	68%	14%
Pigeon pea	38%	27%
Groundnut (late monsoon)	4%	8%
Green gram	4%	14%
Rice	4%	0%
Others	7%	3%

Table 4. Monsoon season crops of Yenangyaung and Chauk townships

Winter season (October-January) crops: In Yenangyaung township, the highest percentage of respondents (34 per cent) grow sunflower followed by sorghum (29 per cent) and sesame (13 per cent). Other crops grown during the winter include cotton, onion, and others. 25 per cent of respondents reported that they were unable to grow any crops during the winter season. The main winter crops grown in Chauk township are sesame (10 per cent), sorghum (8 per cent), green gram (8 per cent) and groundnut (8 per cent). Lablab beans, cotton, and other crops are also grown during the winter season. The majority of respondents (63 per cent) said that they could not grow any crops during the winter.

Crops	**Yenangyaung township**	**Chauk township**
Sesame	13%	10%
Cotton	7%	3%
Sunflower	34%	0%
Sorghum	29%	8%
Green gram	0%	8%
Onion	11%	0%
Lablab bean	0%	7%
Others	7%	5%
Cannot grow	25%	63%

Table 5. Winter season crops in Yenangyaung and Chauk townships

3.2 Community land-use practices in the CDZ

Some villages in study areas of both Yenangyaung and Chauk have communal lands that range between 2-16 ha in size. These lands are traditionally managed by the community and some are controlled by monks.

Trees on communal land are often conserved and used for communal purposes; if a person wants to use a tree on communal land, they usually need to request permission to do so from a village leader or monk. In some villages, if a farmer has degraded land, they allow indigenous trees to grow on that land. Some villages have gullies where local trees grow; local farmers traditionally own these trees with the community collectively recognising their ownership. Some areas are designated as village pastures and are used as grazing ground for animals belonging to local farmers. In addition, one of the traditional beliefs in Myanmar is Nat or spirit worship. Many people believe that Nats are sensitive and live on trees, with villagers marking such trees as Nat houses. These traditional beliefs and practices can help to protect trees in FMNR-implemented forests.

FMNR was carried out on communal forest land, pasture land, individually-owned degraded land, gullies, roadsides between villages and bunds adjacent to plots of individual land. Law and policy-related considerations regarding communal land use are discussed further in Section 6.1.

4. Benefits of FMNR

Based on the desk study and success stories across the globe, there is no doubt that FMNR can bring enormous benefits to Myanmar's people.

FMNR has a demonstrated, extensive track record of significantly increasing farmer yields and income in a wide range of geographic and social contexts. Since it was first

introduced in 1983 in Niger, FMNR resulted in the regrowth of woody vegetation across 5 million ha of land in 20 years – or 200 million trees – largely through word of mouth and farmer-to-farmer interactions. This has translated to an additional 500,000 tonnes of cereals produced each year, providing food security for an additional 2.5 million people. In economic terms, FMNR has led to an increase in gross income of US$900 million per year in Niger, spread among 900,000 households or 4.5 million people.[5] This wide and rapid diffusion is a testament to the technique's ability to deliver rapid results on land where it is implemented, providing tangible benefits to practitioners in short time-frames without the need for significant financial investment in tools and other resource inputs.

A key factor in determining the success of FMNR is the ability to change attitudes among communities where it is practised in addition to teaching the agricultural techniques. Success depends on the location, enabling environment and the mindset of a host community. In Myanmar, study areas where FMNR is being practised have benefited in various different ways, according to research findings. The benefits of practising FMNR can be categorized as livelihood benefits, social benefits and environmental benefits.

4.1 Livelihood benefits

WVM's "Improve Economic Livelihood and Environmental Management Project", supported by New Zealand, was implemented between 2014 and 2018. The project included 26 villages in both townships and supported multisector livelihood activities such as land consolidation, water pond and small dam construction as well as FMNR. To quantify the positive impacts of FMNR in the improvement of livelihoods across communities is difficult as there was no baseline; however, qualitative data shows FMNR's positive impact on livelihoods.

Although villagers did not report improvements during the four years of the project, today villages in both townships have established small areas of forest and report benefits such as more rainfall, reduced temperatures and higher crop yields, as well as water retention and improved soil. Wood and building timber are more available for personal use and sale. For instance, communities can obtain firewood from pruned tree branches for their household use and can generate additional income by selling the firewood for palm jaggery production.

Women and children spend less time gathering firewood as they do not have to walk long distances to collect it, which leaves more time for education or additional economic activities. The community can also harvest fodder for livestock from these pruned tree branches; some species are particularly rich in protein. Improved water retention means water is available for livestock in the dry season. FMNR also supports better

[5] World Refugee Council's Global FMNR Factsheet

grass growth for livestock, improving families' protein sources as well as potential income.

Land degradation is a complex and detrimental problem that affects many aspects of human life in Myanmar. Agriculture production on degraded land results in poor yields and poor nutrition for smallholder farmers. In the study areas, mass labour migration to the cities is also a problem.

The indirect benefits of FMNR help the local community find ways to improve their living conditions, improve food security and curtail the need for outward migration to urban areas. Money saved on building materials, firewood and fodder can be used for healthcare and education for their children. ***One CSO leader said that "All villagers have the right to benefit from our village's own forest. Currently, we allow using the wood for the social purposes of the village. For example, we use wood in the construction of houses for teachers and new households".***

Figure 9. Wood poles from an FMNR forest that are used for building houses.

4.2 Social benefits

(a) Social cohesion

A key benefit of FMNR is that it creates a space for people to engage and allows them to actively participate in the process. For example, throughout the FMNR process, a community can engage in various stages such as site selection and species selection, provide labour, as well as overall management. People of any age or background can become involved in FMNR activities. At the same time, it can help people to share their

experiences and knowledge regarding the history of their surrounding areas, especially regarding the forest, land, water, wildlife and even weather conditions in the past and present. Through these processes, FMNR creates informal learning centres for participants to upgrade their skills, knowledge and capacity in many different ways.

Through their involvement with FMNR projects, participants become more aware of their environment, which provides them with the insights and opportunity to do something positive for their local community. FMNR activities are not just an opportunity for people to learn about trees, but also enable people to make a connection with their local community and local environment, and gain practical, hands-on experience in regeneration and maintenance. Through participation in the FMNR process, participants can become more cohesive and find new ways to carry out collective projects, not only with FMNR but also for other social functions. Increased social cohesion is a common effect of FMNR in most of the countries where it has been applied.

(b) Stakeholder engagement and networking

The process of designing and implementing FMNR activities provides the chance for local communities to engage and deal with relevant stakeholders and government representatives for mutual interests and benefits. Study participants have expressed that by developing plans for the management and protection of FMNR-established areas and plots, they have better engagement with the local government and line departments such as the Forest Department and Department of Agriculture.

Through regular engagement and collaboration, communities have been able to convince local officials to recognize forests established on communal land. Government recognition of communal forests is a critical factor in encouraging the regeneration of trees on communal land. By collaborating with such stakeholders, local communities have been able to voice their challenges and have created the spaces required to articulate their needs to rural development policymakers.

(c) Women engagement and empowerment

Generally, women's voices and opinions are often overlooked in discussions, and women are rarely involved in the decision-making process in rural areas of Myanmar. FMNR facilitates social inclusion and creates the space for women to voice their opinions and thoughts. Increasing women's participation in activities such as training, management of FMNR land, regeneration and pruning activities are some of the ways FMNR can be leveraged to empower women. Women's status in a community is elevated when they participate in decision-making activities, in particular if they are able to take on leadership roles, which leads to an increase in women's social standing and agency.

Women in rural areas of Myanmar tend to hold the primary responsibility for household energy needs and fuel collection. Children, especially girls, also take part in these tasks.

Because FMNR increases firewood supply and reduces the time required by women and children to collect firewood, women and children's burdens are reduced. Women have more time to pursue other economic activities and children have more time for education. Indeed, FMNR contributes to addressing inequality gaps in gender, resource access, benefits, participation and representation.

4.3 Environmental benefits

Climate change has led to shorter monsoons in Myanmar's CDZ, resulting in low yield and failure of crops. Consequently, farmers depend on communal forests for firewood, charcoal production, logging and honey, which they sell to generate subsistence income. The disappearance of communal forests therefore present a major livelihood challenge.

WVM's promotion of FMNR was initiated to not only strengthen existing communal forests but also privately-owned forest land around Yenangyaung and Chauk townships in order to mitigate increasing deforestation and forest degradation and to address the negative impacts these phenomena have on rural livelihoods. In 2010 and 2014, WVM selected 21 villages in Yenangyaung township and implemented FMNR practices on 109 ha, including communal forest and private land. FMNR is still being implemented on 61 ha, of which 20 ha is growing well, 30 ha is fair and 10 ha is poor. In Chauk township, the project included 197 ha near 20 villages. In these areas, FMNR is still being implemented on 151 ha, of which 93 ha are growing well, 49 ha are fair, and 9 ha are growing poorly.

CBO leader U Myint Soe, from Kyun Chaung Lay village, Yenangyaung township, reflected that *"Our village forest was degraded in the past. However, after adopting the FMNR practices, it became a real forest after a decade. It happened because of the active participation and collective efforts of all the villagers. We are pleased and proud of our forest because it was accepted as the model FMNR forest and also recognized and appreciated by the Forest Department".*

4.3.1 FMNR and mangrove

While FMNR is best known for its transformational impact in semi-arid, dry and degraded lands, it has been rapidly developed and successfully practised in mangrove areas in the Ayeyarwady Delta and Rakhine coastal areas in Myanmar.

In 2015, a project team from DEAR Myanmar and the forest management committee planned to use FMNR methods to enhance the expansion and growth of mangrove habitats in five villages in Pyinsalu, Labutta township, Ayeyarwady Delta. This was initiated under the Green Coast, Community and Improved Livelihood project, supported by the Myanmar Environment Rehabilitation-Conservation Network (MERN).

FMNR was carried out by pruning the stumps of cut mangrove tree trunks. Each forest management committee assigned one focal person to lead the community pruning activities. The project covered 142 ha in five villages. The FMNR method for mangroves was introduced by a project staff member who was a former WVM team member and who had led FMNR implementation in Yenanchaung as part of a WVM project. The FMNR technique not only enhanced the expansion and growth of the mangrove areas, but also expanded crab farming and improved local incomes.

Likewise, MERN implemented a mangrove component for the Coastal Livelihood and Environmental Assets Restoration in Rakhine (CLEARR) project from 2011 to 2014 that included mangrove rehabilitation and restoration with natural regeneration techniques including FMNR. This was led by the village conservation committee and forest labour group. The project was able to successfully rehabilitate severely degraded mangrove forests and replant gaps within the mangrove. The team conducted regeneration improvement felling (a felling technique that involves thinning out unwanted trees) in mangroves and generated benefits for local communities including access to firewood and income from selling wood, which was reinvested in future mangrove conservation activities. FLG members also received access to these income opportunities.

The successes of the project show that FMNR is an effective tool for rapid conservation and rehabilitation of degraded mangrove forest areas in Myanmar that could be expanded around the world.

5. Major Challenges of FMNR in the CDZ

5.1 Contextualized constraints

(a) Free range grazing practices

The CDZ supports almost 50 per cent of Myanmar's livestock production. In the study area, 24 per cent of respondents reared livestock as their main income source. Livestock rearing in Myanmar is mainly carried out on 'backyard farms', with feeding provided in traditional ways such as grazing in communal fallow areas within and around villages, or scavenging in the village environment and using standing crop remnants and by-products. Farmers in the study areas practise free-range grazing for their livestock, especially in the summer season when fodder is scarce. In some cases, herders cut trees to feed their animals. If the communal land where FMNR is practised is far from a village, it becomes harder to protect it from grazing livestock.

(b) Bushfires

Fire presents another challenge for FMNR. Bushfires in the CDZ are very common, especially in the dry season. Fires are usually started by humans, both intentionally and unintentionally. In most cases, fires are started by cigarette butts dropped by smokers. Another cause of fire is hunters who use fire to flush animals out of bushes. Piles of pruned branches from FMNR trees can act as fuel for fires in the dry season. Although fire is recognized as a problem by communities, they have become normal and people think they do not have the power to stop it.

(c) Charcoal production

Production of charcoal used to be very common in the region. Charcoal makers sometimes remove living tree stumps and roots for charcoal production. Although charcoal production is now less when compared to the previous decade, it still remains an income source for local people.

(d) Labour shortages

Outward migration is common in Myanmar's CDZ for economic reasons, particularly for employment in non-agricultural sectors such as road construction. Most of the migration is internal migration to another region or state in Myanmar. Younger adults tend to migrate from rural areas for work, while parents and older persons remain in the households. Some of the farmers have to hire labour for crop production because household members have left. As a result, most of the respondents mentioned that labour scarcity is a key obstacle to practising FMNR.

5.2 Technical constraints

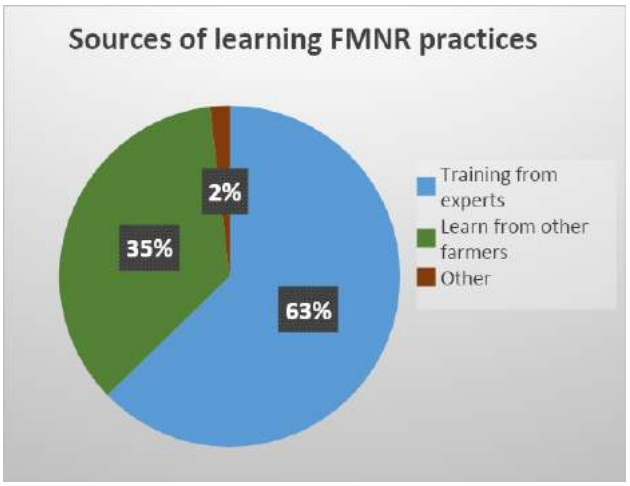

Figure 10. FMNR learning sources

In the study areas, 63 per cent of respondents reported that they have received FMNR training from technical experts, including from Tony Rinaudo and WVM staff. Thirty-five per cent of respondents said that they learned FMNR practices from others who had received training (Figure 10). As such, they still want to learn FMNR from technical experts. Respondents also noted that they want leading organizations such as CBOs and NGOs to support them, not only in learning FMNR techniques but also for training in other areas such as agroforestry, sustainable crop management, FMNR on farmland, crop rotations, microfinance, self-help groups, fire prevention, pruning, maintenance and establishing nurseries for forest tree seedlings.

During the FGDs, it also became apparent that some farmers were practising FMNR improperly or had reverted to traditional methods. Traditional pruning techniques involve removing all of a tree's branches and go against FMNR principles (Figure 11).

Figure 11. Local practice of pruning/cutting tree branches

5.3 Legal constraints

5.3.1 Land tenure

Land tenure in Myanmar is complicated. When a site is chosen for FMNR implementation, it is necessary to first identify the type of land, how it is used, and its ownership status.

It is also necessary to identify the relevant government department and regulations to which the project must conform. There are three key departments managing land use in the CDZ: the Forest Department from the Ministry of Natural Resources and Environmental Conservation (MONREC), the Department of Agriculture Land Management and Statistics (DALMS) under the Ministry of Agriculture, Livestock, and Irrigation (MOALI), and the General Administration Department (GAD) under the Ministry of Home Affairs.

Most communities do not know their tenure rights, ownership status, and type of land use permitted. In many areas traditionally held or community-given rights are respected. However, if they do not have legal recognition, they may face problems and disputes in the future.

Communities in the CDZ have poor access to information on land tenure rights and are unaware of which government departments to engage with for certification processes. Knowledge sharing and awareness sessions on land tenure and how to carry out the legal application process should be organized. Some individuals have experienced how FMNR regenerated trees in communal forest and now want to implement the technique on their own private land. FMNR training needs to include information on how to engage with relevant departments for land tenure security.

5.3.2 Recognition of communal forest

If communities want to register their conserved forests, they also must understand the legal process. In Yenangyaung, at Kyun Chaung Lay village, 8 ha of FMNR-implemented forest was registered as Communal Forest at the Forest Department.

Another issue of land security issues is demonstrated in Phan Kha San where the village was preparing to apply for a communal forest certification but a private company applied to have the land turned into a large plantation. Because the private application had been made first, the community could not submit its application. Similar scenarios have affected other villages in the region. The more communities are aware of the laws and policies related to land and forests, the more they will be able to leverage those laws to strengthen their communal resources.

5.3.3 Use of forest products

In both townships, communal forests conserved through FMNR produce products such as firewood and wood for use in communal construction projects, such as construction of bridges, temples, communal buildings and making farming tools. In order to use these products, local communities need to inform the Forest Department and obtain

legal approval to harvest communal forest products on a commercial scale. The community must know the legal procedures if they are to fully realize the benefits FMNR can bring to their communal land.

6. Enabling Factors for FMNR in Myanmar

6.1 Law and policy

The research team conducted desk research and KII with a retired Forestry Department director to ascertain the current state of laws and policies related to FMNR in Myanmar. In Myanmar, only 18-20 per cent of communal land is actually officially recognized as such by the relevant government agencies. In order to avoid the possibility of facing legal repercussions – or ultimately losing control of land that is regarded as communal by village communities but not officially recognized as such – it is important that FMNR-practising communities are instructed on the correct and official protocols for obtaining official certification for communal land.

If FMNR practices are integrated with related land-use policies and laws such as the Myanmar Forest Policy, Forest Law, National Land Use Policy and Law, and so on, it will be easier to convince communities to follow and spread FMNR practices. It is important to understand how FMNR can be linked to communal forestry and how existing

community forestry instruction can support FNMR. According to an interview with a forester who has extensive experience in dry zone areas, forest areas that are managed by the Forest Department can be classified as reserved forest, protected public forest, and as protected areas. Village-owned forests (communal forests) are traditionally or customarily owned, but are in general not legally recognized. So, if forest regenerated through FMNR is classified as forest land, it would fall under the categories of reserved forest or protected public forest area. A community must apply for a community forestry classification to receive a land ownership certificate for such land; this is the only legal avenue to pursue for land tenure security. Without having a guarantee of land ownership, the development and spread of FMNR practices is challenging.

The following are the key national policies related to FMNR:

(i) Myanmar Forest Policy (1995)

Six imperatives identified in the policy are:
(1) Protection of soil, water, wildlife, biodiversity and the entire environment;
(2) Sustainability of forest resources to ensure a perpetual supply of both tangible and intangible benefits accrued from the forests for the present and future generations;
(3) Basic needs of the people for fuel, shelter, food and recreation;
(4) Efficiency to harness, in a socio-environmentally friendly manner, the full economic potential of the forest resources;
(5) Participation of the people in the conservation and use of forests; and
(6) Public awareness about the vital role of forests in the well-being and socioeconomic development of the nation.

(ii) Forest Law (2018)

The basic principles for management of forest land, conservation and protection, administrative actions, and offences and penalties were revised and updated in the new Forest Law (2018). The new Forest Law comprises nine basic principles and 58 sections under 13 chapters, highlighting the constitution of reserved forest and declaration of protected public forest, management of forest land, the establishment of forest plantations, extraction and removal of forest produce, disposal of drift, stranded and waif timber, the establishment of wood-based industry, and the administrative action (search, arrest and administrative action) in respect of offences and penalties. The new law recognizes local and indigenous peoples' rights, encourages people's participation in forest management, private sector involvement in forestry sector development, human resource development and extension to local people.

(iii) National Land Use Policy (2016)

This law aims at implementing, managing, and carrying out land use and tenure rights in the country systematically and successfully, including both urban and rural areas, in accordance with the objectives of the policy. It shall be the guide for the development and enactment of a National Land Law, including harmonization and implementation of the existing laws related

to land, and issues to be decided by all relevant departments and organizations relating to land use and tenure rights.

To establish a communal forest and FMNR plots in an area, community members and leaders need to thoroughly learn the updated community forestry instruction (2019) policies and laws. and need to discuss with relevant government representatives to understand regulations governing the establishment of communal forests.

6.2 Community awareness and participation

Community awareness and participation is another enabling factor for the success of FMNR practices. The study evaluated awareness and participation by asking respondents in FMNR project areas of Yenangyaung and Chauk townships whether they had heard of FMNR, been trained on FMNR, how they understood it, and whether they practised FMNR. The survey also included a question on where the respondents practised FMNR. Information obtained from these questions was complemented by qualitative data from FGDs and KIIs.

According to the survey results, 80 per cent of respondents stated that they practise FMNR; 20 per cent of respondents stated that they had heard about FMNR but they had not practised it; 5 per cent could not practise FMNR because they did not own any land.

Effective community participation is extremely important to the establishment and success of FMNR. Based on the previous experience and observation of practitioners engaged in FMNR in Myanmar, it has been noted that direct participation of key community stakeholders in FMNR projects from the beginning is a critical factor in determining a project's success – a point that is also emphasized in FMNR training materials. Community participation should begin with the conceptualization of the initial project idea and preliminary design phase all the way through implementation and evaluation. It is important to create spaces for communities to participate in every stage of preparation, inception, implementation, monitoring, and evaluation. Doing so can strengthen the chances of FMNR's success in the long term. Community participation and awareness are inseparable; so, to generate active participation, awareness-raising activities need to be conducted frequently.

6.3 Information technology and communication (ITC)

A limiting factor to the success of FMNR is access to information and the ability to communicate with technical experts. The study showed that most people in the study areas do not have extensive knowledge of ITC and are largely unaware of its potential benefits. Lack of basic ITC knowledge and inability to access technical resources found online makes following FMNR more challenging.

Although there are plenty of resources of FMNR-related information such as the FMNR manual, technical flyers, guidelines, and global success stories, almost all of these

resources are found online and are written in English. Thus, greater accessibility to FMNR materials for stakeholders in FMNR project areas will facilitate the dissemination of FMNR technology in the country. Both field staff and FMNR farmers should be equipped with ready access to technical information in local languages. The study has highlighted how a more concerted effort needs to be placed on developing ITC-based FMNR resources and access in project areas. For example there are online training courses and radio programs for FMNR in other countries, which could be replicated in Myanmar.

Within this context, internet access can help overcome barriers on physical interactions and build bridges between communities. Access to accurate and relevant information related to agroforestry in general and FMNR in particular is an essential component to improve lives in rural communities.

6.4 Financing

Requests for financing and materials have to be carefully evaluated for the Myanmar context, as these have not been a hindrance for farmers practising FMNR in other countries. FMNR projects implemented in other countries have demonstrated that every farmer has a knife or similar implement which can be used to practise FMNR. Financial support is also unsustainable and becomes the incentive to do the work, rather than FMNR's multiple benefits being the primary motivation.

Nevertheless, FMNR projects in other countries have added complementary activities that promise to provide benefits in the short-term (before benefits can be felt from the trees themselves). These can include improved seed and farming techniques, formation of savings and loans groups, and other associated improvements. In this way, benefits are linked to FMNR work, but are not viewed as payments for carrying it out. Once farmers start to benefit from FMNR work, they no longer need to be convinced with incentives to continue. With the right messaging, projects can reduce the temptation of farmers only doing the work in order to gain the incentives.

According to the study, 77 per cent of participants stated that they have access to financing, However, they have also added that the current loan amounts they receive do not cover the total costs of farming. The main sources of finance are the Myanmar Agricultural Development Bank (MADB) and micro-finance. The MADB is a state-owned bank and carries a low-interest rate (7 per cent), but it requires a land-use certificate (Form 7). The loan amount provided is 100,000 kyat per acre (0.4 ha) for upland crops such as sesame and groundnut, but each farmer is limited to a loan for a maximum of 4 ha.

The challenges of this financial service are that there is no financial education component and loan disbursement tends to be delayed and reaches recipients long after they have had to source funds for agricultural activities. The lack of financial education among rural people leads to a lack of investment in income-generating activities in rural areas. Some participants access finance through microfinance

providers such as Pact Myanmar and Proximity Design, which carry affordable interest rates. Savings groups, the formation of which was facilitated by WVM, were present in some of the villages visited during the study, and offered another source of finance, especially for women.

According to a discussion with an official from Zega Finance, a non-banking financial institution active in the agriculture sector in Myanmar, although there are agriculture finance products for farmers, there is no specific product for FMNR farmers yet. The official expressed the view that there is a potential for new FMNR-specific loan products such as long-term loans for FMNR-practising farmers. The official also mentioned that crop insurance for farmers can be integrated into these financial products. As the offices of microfinance institutions are not located in rural areas, the reach of these financial services can be limited. However, they can serve as potential financing partners for projects implemented in rural areas by partnering with local farmer associations or other cooperatives. Easier access to finance can be a major incentive for farmers who practise FNMR.

Additional financing support

By restoring degraded forests and land, FMNR sequesters carbon, one of the many valuable ecosystem service contributions of the technique. Given the global recognition of the need for carbon sequestration as a means of climate change mitigation, there are opportunities for FMNR to harness revenues through generating carbon credits.

FMNR projects in other parts of the world have successfully incorporated revenues from carbon credits for generating income streams for communities. In Ethiopia, carbon stock monitoring data from World Vision's 2,700 hectare Humbo Community Managed Natural Regeneration Project (2005-2018) found that FMNR activities led to the sequestration of 181,650 tonnes (net) of carbon dioxide from the atmosphere between the period of 2006 and 2018.[6] This has translated into significant revenues for the community. Another FMNR project where carbon credits have been successfully channelled to supplement revenues is in Mpika, Zambia.

Further study is needed to determine how these successful carbon offset initiatives within FMNR projects can be replicated and adapted to the Myanmar context. Seeking and promoting carbon offsets and revenues through community-managed forest restoration that results from FMNR projects should be actively pursued in Myanmar.

6.5 Roles of CBOs and CSOs in FMNR

Based on the study findings, the relationship between CBO leaders and village administrators has tremendous influence and impact on FMNR and its sustainability. Every village has a CBO created to support health, education, skills development training and other social affairs in the village.

[6] World Vision, 2019

In Myanmar, these organizations tend to be well-structured and include leadership positions such as president, deputy president, treasurer, auditor and secretary. However, many CBOs in the villages studied were not active in FMNR projects because they do not constitute part of their mandated activities. Furthermore, as a result of COVID-19 and the political situation, many CBOs and their respective communities are not able to meet or actively collaborate at all. Regardless of the cause, a lack of good leadership and organization is an overwhelmingly common issue in villages that have been unsuccessful in implementing or following through with FMNR.

CSOs are also critical to the successful implementation of FMNR because they lead in influencing laws, regulations and their implementation, as well as influencing decision-making through lobbying and advocacy activities. However, as a result of the political situation, both CBOs and CSOs are facing significant challenges in meeting and operating, if they are able to do so at all.

Nevertheless, despite the challenges, there are certain CBOs and regional associations that have expressed interest in collaborating with FMNR. For instance, the Magway Regional Farmer Development Association (RFDA) is a regional level association that currently covers six townships in the Magway region. Some of WVM's FMNR project villages are also included in the Magway RFDA for collective marketing. According to the secretary of the RFDA, the organization would also like to collaborate on FMNR projects.

6.6 Potential partners for implementing FMNR in Myanmar

Strong partnerships are critical in developing a plan with strong collaboration between stakeholders. Existing organizations provide expertise and familiarity with the local contexts and can help to foster a shared vision and mission among partner organizations. Based on the discussions and expressions of interest communicated during the study's stakeholder consultation workshop, potential partners have been identified for collaboration on large-scale FMNR projects in the future.

During the stakeholder consultation workshop, most of the attendants were interested in FMNR concepts and practices and demonstrated a willingness to implement FMNR in their respective areas. They acknowledged that FMNR practices are a valuable, sustainable land restoration technique that are practical and suitable to the Myanmar context. Participants from some organizations also shared their experiences in implementing forest conservation, community forestry, mangrove conservation and agroforestry projects with communities in their areas that practised reforestation techniques similar to FMNR. These organizations have echoed the view that such practices are beneficial for local communities and ecosystems.

The process of implementing FMNR can help strengthen and build capacity for weak or inexperienced organizations, or those new to the area. According to the stakeholder consultation workshop, the following organizations (Table 7) were identified as potential

partners for FMNR implementation. These organizations have already become established as important actors in supporting the spread of the FMNR and have already played a significant role in raising the status of FMNR to its current levels in the country.

As per the field trip observation of the consultant team, World Vision Myanmar is one of the most important partners to implement FMNR in the CDZ because they have already introduced and implemented FMNR in Yenangyaung and Chauk township in the Magway region. For instance, through WVM and by using its existing relationship and trust with the community, the pilot FMNR project can be implemented successfully in a short period. By doing so, it would be easy to expand and spread FNMR in the targeted areas. The most important thing is that the existing villages and FMNR farmers can be re-engaged and involved in the FNMR activities, and they can brush up on their capacity in the upcoming project. They will also become valuable resources for the FMNR movement in the country.

Table 7. Potential partners for implementation of FMNR in Myanmar

No.	Name	Organization
1.	U Aung Thant Zin	MERN
2.	Daw Ni Ni Soe	OISCA, Agriculture and Rural Development Training Centre
3.	U Myo Ko	POINT
4.	U Than Htay	REAM
5.	U Myo Oo	Green Network
6.	U Saw David	KKBA
7.	U Naw Aung	Myitphya Eyar Natural and Heritage Organization (MENHO)
8.	U Mung Ra	Kachin Conservation Working Group (KCWG)
9.	U Kyaw Win	Central Environmental Development Association (CEDA)
10.	U Than Htike Win	Youth Strength Association (YSA)
11.	U Khine Oo	Rakhine Strengthening Social Development Organization (RSSDO)
12.	Daw Mya Hnin Aye	Regional Farmer Development Association
13.	U Aung San Oo	Tree Growers Team
14.	U Kyaw Zan	Farmer
15.	U Thein Oo	Sein Lann So Pyay Anyar Myay CSO
16.	Daw Khaing Khaing Htun	World Vision Myanmar
17.	U Saw Mar Ku	World Vision Myanmar
18.	Dr. Naing	DEAR Myanmar

WVM is one of the most important partners for implementing FMNR in Myanmar's CDZ as they have already introduced and implemented the approach in Yenangyaung and

Chauk townships in the Magway region. Through close consultation with WVM and by using its existing relationship and trust with the community, the pilot FMNR project that WWF-Myanmar is seeking to launch can be implemented successfully in a short period. Existing villages and FMNR farmers can be re-engaged and involved in the FNMR activities, and they can brush up on their capacity in the upcoming project. They will also become valuable resources for the FMNR movement in the country. Following the pilot project, it would be relatively simple to expand and spread FNMR in targeted areas, given adequate investment and partnerships with local and international stakeholders.

6.7 The role of implementing staff

Although FMNR is a simple technology, the adoption and dissemination of FMNR practices is incomplete and often inconsistent in the field. Results vary depending on staff and stakeholder attitudes and dedication. In parallel to program design and other high-level issues such as budget, scope and time constraints, the role of FMNR implementing staff is fundamental to the success of the technology.

During the initial stages of an FMNR project, community mobilization and awareness-raising activities are essential. Field staff play a critical role in laying this groundwork. Committed and dedicated staff will be needed to build up relationships and rapport with target communities. Staff need to be well trained for these roles prior to the community engagement phase of an FMNR project. In order to do so, it is important to select staff who have either experience in agriculture and environmental protection, or who demonstrate a strong dedication to understanding these fields more and realizing the goals that FMNR has been designed to achieve.

WWF-Myanmar attended the FMNR staff training event organized by World Vision Academy. WWF-Myanmar staff members were able to learn both theoretical and conceptual knowledge of FMNR practices to apply in the field. In addition to this technical and theoretical knowledge regarding FMNR, it will be valuable to conduct trainings on how to effectively organize and mobilize communities in order to maximize the impact of any potential FMNR project in the target areas.

6.8 Support activities for scaling up

FMNR practices are simple, user-friendly and appropriate techniques for dry zone areas, and easy to apply in the field. However, compared to other countries where FMNR has been rolled out through concerted, long-term programmes, the adoption and diffusion rate in Myanmar is significantly lagging. This is due largely to the lack of adequate implementation support activities, such as training sessions, seminars and community mobilization events. WVM's strategy positioned the CBO as the most crucial organization for village development activities. Although CBOs are the most adequate pre-existing organization in villages, they are also used to engage in other important

tasks. There are no sub-groups or committees to lead FMNR activities in the villages. As a result, FMNR adoption rates have decreased even within project villages.

Inadequate policies and a lack of a facilitating environment are key contributors to the stalled dissemination and adoption of this technology in Myanmar. Indeed, there are no concrete policies covering FMNR at the ministerial level. However, there are examples of similar bodies that could be replicated or integrated into an FMNR strategy. For example, there are clear policies and guidelines governing Community Forestry. Relevant departments also conduct awareness-raising activities to educate the public on communal forestry management and regulations. The Forest Department is the central actor in these initiatives and plays a critical role in improving the forestry sector. The DZGD has also been established for dry zone areas, in order to facilitate attention on re-greening the vulnerable environment in the region.

The Forest Department promotes natural regeneration practices, which are in fact similar to FMNR. The main difference is that FMNR provides space for community participation and management; indeed, this communal factor can be viewed as the essence and guiding principle of FMNR. In contrast, there is little room for community participation in activities undertaken by the Forest Department. Advocating that the Forest Department adopt and promote FMNR may be a worthwhile undertaking as part of a broader FMNR project in Myanmar.

Likewise, there are several INGOs and LNGOs that are working on environmental conservation and CF activities. However, the only NGO with a clear track record of implementing FMNR in Myanmar is WVM. Because of this limitation, spreading the technology throughout the country will be challenging. When it comes to the diffusion of FMNR, national or regional level working groups will need to be put in place and organized forums to share FMNR experiences. However, there are currently no such working groups.

Finally, the selection of villages and regions for an FMNR project needs to be undertaken carefully, as it will play a major role in determining a project's success or failure. The following table outlines the main factors and reasons determining FMNR's chances of success or failure in a village. Despite the clear benefits FMNR can bring to agricultural communities threatened by climate change and other pressures, it is important to always remember that rural people and communities have many challenges to cope with in their daily lives. As one villager interviewed in the study said:

"We like to do FMNR on our land because we believe that this technology is valuable for us, and it definitely can bring a positive impact on our surrounding areas in the long term. But we cannot focus on it entirely since we have to try to survive and make money."

The table lists some of the factors determining success and failure of FMNR in various target villages.

No	Success	Failure
1	Having communal land	Lack of team spirit and teamwork
2	Continuous coaching and monitoring	Grazing livestock
3	Good leadership	Poor leadership
4	Good relationship among CBOs and village administrators	Lack of awareness of all key stakeholders including hunters and herders
5	Strong CBO and good governance	Land is too far from the village
6	Self-motivation and youth participation	Lack of benefit sharing mechanisms
7	Highly aware of the benefits of forest cover and FMNR	Less communal land and landless people
8	Strong collective efforts and determination to protect existing FMNR	Bush fires
9	Project sites are close to villages and easy to access	Lack of labour force due to migration
10	Led and conserved by religious leaders, monks	Lack of follow up and mentoring beyond the project scope
11	Social norms, beliefs, and traditional Nat worshipping	Lack of rules and regulations; poor governance
12	Rainwater harvesting, retention and check dams	Poverty

7. FMNR success stories in Myanmar

FMNR on communal forest land at Kyaung Chaung Lay village, Yenangyaung township, Magway region

U Myint Soe, CBO leader from Kyun Chaung Lay village, shared this success story of FMNR on communal forest land.

Background

Kyun Chaung Lay village is situated in Nyaung Pin Aing Village Tract, Yenangyaung township of Magway region. It is 26 miles from Yenangyaung township. The village has a population of about 470 (224 M, 246 F) and 100 households. The major economic activities are small-scale livestock rearing and subsistence farming

of crops such as sesame, groundnuts, and pigeon pea. Many landless people work as seasonal farm labourers, migrating to urban regions during the non-planting season to find temporary employment. In addition to farming and livestock rearing, villagers make charcoal, cutting trees and digging tree stumps as daily work. The village has 8 ha of communal forest land. Local people have been reliant on the communal forest for firewood, wood for charcoal, and honey for many years. As a result of these logging activities, only the hills remain. In simple terms, there has been extensive deforestation because there are only loggers and no re-foresters. Due to deforestation, the village is facing drought, high temperatures, decreasing crop yields, lack of drinking water for livestock, and food shortages.

The effect of FMNR

After attending FMNR training by Mr. Tony Rinaudo, we practised on young trees in the communal forest in 2010. We also established a nursery farm and planted trees in the communal forest with the support of WVM. Through coordination with village administrators and the CBO leader, making charcoal, cutting trees, and digging tree stems in the forest was prohibited.

In 2014-2015, two check dams (0.20 ha each) were built with the support of WVM on the communal forest land, allowing water to be saved for the trees, especially in the summer when very dry conditions prevail in the region. So far, reforestation has been very successful. However, natural regeneration was better for growing trees than the usual process of cultivating trees. We normally prune and manage the forest twice a year. Due to the availability of water in the check dams, the forests are thriving. As tree density has increased in the forest after 10 years, we have earned money from selling trees, which is sometimes donated for community activities. As a result of FMNR, our forest has been re-greened, and our community has received more rainfall, while neighbouring villages still suffer from drought. Neighbouring villages are increasingly interested in FNMR. As per our experience, it is evident that the adoption of FMNR has had a positive impact on livelihoods. Compared to 2010, the environment is greener, which is due to both FMNR and also other associated factors like the community using less firewood as they have received electricity by being connected to the national grid. The community no longer produces charcoal, opting instead to migrate for other job opportunities.

U Aung Myo Min's success story: How FMNR has changed the life of a farmer

I live in Na Ywe Taw Village, 23 km Southeast of Chauk township in the Magway region. I have been an active participant in agriculture and FMNR activities, as well as a pioneer in farmer field school programs.

Our area in central Myanmar is drought-stricken. Many plants are burned for charcoal and chopped for firewood. The forest was destroyed due to a lack of proper pruning systems by cattle and goat herders. This meant that even useful timber became scarce. Farmers have experienced early monsoon drought when they grow seasonal crops.

WVM introduced FMNR to our community in 2010. FMNR has taught us the knowledge of taking care of trees with pruning systems. We have applied this knowledge not only on communal land but also on individually-owned land. Then, we marked FMNR trees with red cloth to mark them as off limits to cattle and goat herders. Now, the forest is well established and funds have been raised by selling wood poles from the communal land. We have used the funds for the re-excavation of the village drinking water pond. Up to 70 per cent of individual farmers are still practising FMNR on trees on their own land. On my 3 acres (1 ha) of farmland I've grown perennial crops (fruit trees) such as jujube, mango, wild almond tree, and amla since 2006. Windbreak trees were also grown at the boundary of the land. For seasonal crops, groundnut, lablab bean, and cotton are grown for intercropping. I applied the FMNR method to fruit and windbreak trees after transplanting them at two years from seedlings. Since then, I have used the FMNR method on these trees every year. I also grow vegetables like pumpkin, bottle gourd and roselle on the farmland. The use of mulching is an effective method that can help farmers increase production and produce quality. I have also made compost with crop residues and dried weeds together with effective microorganisms (EM), fish amino acids, and rice bran, and then used this compost as fertilizer for my farmland.

Before venturing into FMNR, I had earned around 2,250,000 Kyats ($1300) per year from my 3 acres (1 ha) of farmland, selling groundnut and soybean. Now, I have earned 6,000,000 Kyats ($3400) in from selling groundnut, lablab bean, and cotton seasonally, and mango, pumpkin, bottle gourd, and roselle. Next year, I hope to generate more income from amla (zee phyu), guava, and sandalwood which is grown around the farmland as a windbreak tree. When the perennial crops are too tall, intercropping may be difficult. So, I plan to carry out livestock farming. As an FMNR practitioner, I worked hard and followed the process systematically. I also participated in collective activities on communal land. We have recorded daily rainfall levels and made cost and benefit calculations. We also take care of communal forest areas together. Depending on the profit, some neighbouring farmers have followed my approach and adopted similar practices.

I have a wide range of motivations for taking up sustainable land management practices, including FMNR. Overall, I experience a sense of improved well-being, from enhanced nutrition, soil fertility, and income. Therefore, I extend special thanks to all who provided us with technical support from WVM. In the future, I hope that I can share my experiences with other farmers if I have the chance.


Windbreak Trees


Jujube Plant


Mango (Sein Tha Lone)


Amla (Zee Phyu) Plant


Making compost with crops residues and dried weeds together with
fish amino, EM and rice bran

Success story of U Kyaw Zan, Yone Kone village, Yenangyaung township

I am a farmer, living in Yone Kone village, Yenangyaung township in Magway region. I have five family members and own 3 acres (1 ha) of farmland. I was growing sesame and sorghum on my farmland. But the yield was not good because of land degradation. I also grow forest trees and perennial crops. I participated in village development activities as a hobby and attended soil and agricultural-related training provided by CBOs or NGOs organizations when invited.

In 2010, I was invited to attend a forest rehabilitation training, conducted by WVM. In my village, generally, we cut down the trees from the communal forest for firewood, produce charcoal, and dig the trees for our household use, but we did not replant the forest. As a result, we were facing deforestation since before 2010. I was looking for a way to rehabilitate the forest. By the time I completed Mr. Tony's training, I was very enthusiastic about rehabilitating the communal forest and establishing my own forest. On my farm, 1000 zee phyu trees, 50 mango trees, 200 wild almond trees, 2000 thanakha trees, and 20 banana trees were cultivated. With the support of WVM, two small check dams have also been dug to provide water for the trees in the summer. Fish rearing is also practised in these check dams.

As I grow vegetables on the farmland, we don't need to buy vegetables from others. I had earned some money from selling fish and zee phyu. As zee phyu, banana, and fish rearing can be commercialized, I would like to say that the FMNR process is beneficial for us. After a few years, I can get more income from other perennial trees. As a result of the reforestation, the weather has improved significantly in our areas. However, I would like to have more small water check dams on my farmland as water requirements are still not enough.

8. Conclusion

Land degradation is a complex and highly detrimental problem that affects many aspects of human life in Myanmar. Agriculture production on degraded land results in poor yields and nutrient-deficient food for smallholder farmers. Mass labour migration to cities is a major problem in rural communities, in particular those of the CDZ.

WWF-Myanmar's study – and FMNR's pre-existing track record in numerous vulnerable regions of the world – has demonstrated how the practice is a powerful tool for fighting the climate crisis and enhancing food security, water supply, and biodiversity in Myanmar's CDZ.

The study has shown that several years after the conclusion of the last, albeit limited, FMNR project in Myanmar's CDZ, FMNR activities have continued to be practised in some villages while it has ceased in others. Due to the simplicity, low cost, effectiveness, and multiple tangible benefits FMNR technology brings, the rationale for expanding and entrenching FMNR in Myanmar is clear. FMNR will definitely take hold in Myanmar if the shortcomings on adoption and scaling can be addressed. There is a long way to go in realizing these goals, and more comprehensive action is needed. Active community participation is the key to allowing FMNR technology to deliver its full potential.

WVM is one of the most important partners for implementing FMNR in Myanmar's CDZ as they have already introduced and implemented the approach in the region. Through close consultation with WVM and by using its existing relationship and trust with the

community, the pilot FMNR project WWF-Myanmar is seeking to launch can be implemented successfully in a short period. Existing villages and FMNR farmers can be re-engaged and involved in FNMR activities, and they can brush up on their capacity in the upcoming project. They will also become valuable resources for the FMNR movement in the country. Following the pilot project, it would be relatively simple to expand and spread FNMR in targeted areas, given adequate investment and partnerships with local and international stakeholders.

WWF-Myanmar kindly extends an invitation to interested stakeholders to engage with us on possibilities for launching a FMNR project in the country. Together, we can use this powerful, simple and low-cost technology to improve the CDZ's fragile ecosystem, build food security and improve lives for generations.

9. Recommendations

Short term recommendations

Preparatory

- Conduct a feasibility study to investigate the field situation prior to determining locations and partners.
- Organize a national or regional level FMNR symposium to promote and identify potential partners and target areas after the feasibility study.
- Establish both regional and national FMNR working groups
- Develop IEC materials and an FMNR manual in Burmese for distribution to key potential stakeholders.
- Plan incentives schemes that facilitate long-term adoption without establishing financial reward systems that can build dependence and detract from FMNR's benefits.

Partnership

- Find suitable partners to initiate and implement FNMR based on the organization's profile and its focus area(s).
- Engage with prospective organizations who could be future partners for FMNR. WVM should be prioritized because of their experience, skills and community relationships.

Field implementation

- Include existing WVM project villages in the pilot project, in order to reach quick results.

- Organize technical training and education for FMNR and other agricultural components such as land tenure and ownership policies.
- Establish demo plots and simple trials for FMNR on farmland.
- Organize study trips for those who are interested in FMNR. Exchange trips and experience-sharing events are essential for promoting networking and collaboration.
- Provide materials and equipment such as knives and tape.
- Train volunteers to become trainers and service providers.
- Conduct regular FMNR field tutorials and monitor the activities.

Long term recommendations

Advocacy & Networking

- Produce and distribute IEC materials to different channels in order to reach key stakeholders such as farmers, religious and community leaders, government officials and teachers, etc.
- Establish an FMNR working group or network at the national level. WWF-Myanmar should initiate and lead this working group.

Awareness Raising

- Community mobilization and sensitization are always important. Thus, it is important to prioritize awareness-raising workshops and events throughout the FMNR project period. No one should be excluded from these sessions, which should be targeted at key actors identified through stakeholder mapping. For instance, in the study areas, scarcity of pastureland and using free grazing practices for animals is a major challenge for FMNR. Managing conflicts between crop farmers and livestock owners is crucial for FMNR, as young trees are easily destroyed by livestock. Therefore, proper awareness-raising sessions for livestock keepers, hunters, and herders are needed in FMNR villages.
- Proper rules and regulations are essential for protecting FMNR in the areas where it is practised.

Knowledge sharing

- Aside from the core FMNR technology, other related technical training should be provided addressing topics such as conservation agriculture, compost-making, seed saving, cropping patterns and systems, agroforestry, bush fire prevention and management, and so on.

- As a result of COVID-19 restrictions and political instability, the communities have not been able to meet up with each other. In order to overcome these and any further disruptions to inter- or intraregional travel, it is highly recommended that basic digital literacy or ITC training is provided for committee members, so that it is possible to organize meetings through online platforms.

Financing

- When it comes to FMNR, financial support is unsustainable and becomes the incentive to do the work, rather than the practice's multiple benefits being the primary motivation. As such, the emphasis should be on communicating and demonstrating the long-term, sustainable benefits of implementing FMNR, which is by its nature a low-cost and simple technique.
- An FMNR project in Myanmar can add complementary activities that promise to provide benefits in the short-term (before benefits can be felt from the trees themselves). These can include improved seed and farming techniques, formation of savings and loans groups, and other associated improvements. In this way, benefits are linked to FMNR work, but are not viewed as payments for carrying it out.

Key points to consider

Advocacy and Networking

- There is a strong need to establish a leading FMNR working group or committee. Otherwise, it will be difficult to organize and guide communities in FMNR activities. There are currently only CBOs in the study villages; although they have FMNR activities, these activities are not their main task, which means they are not given the necessary prioritization for success.
- Inter-organizational coordination should be promoted and facilitated between relevant government departments such as the Forest Department, the greening department, and universities in order to carry out extension and conservation work, as well as research activities in accordance with WWF-Myanmar and its partner organizations' vision, missions, priorities and mandates.
- The International FMNR platform and other relevant networks should be introduced to target communities by WWF-Myanmar in order to provide them with exposure to experiential learning.
- It is highly recommended that all key stakeholders such as village administrators, CBOs, NGOs, and relevant ministry departments collaborate

more and pay more attention to promoting FMNR's adoption by their local communities.

- Based on the findings of the study, religious leaders wield considerable influence on communities. Rural monks can be charismatic leaders in their respective villages and can serve as gatekeepers to community mobilization efforts. As such, it is important to build rapport with local monks and to coordinate community FMNR activities with them whenever possible.

Implementation

- FMNR site selection is important for a project's long term success and sustainability. It will be difficult to access FMNR areas if they are too far from a targeted village. Creating the space for communities to become involved in the decision-making process based on their experiences is critical.
- To assess the effectiveness and impact of FMNR on a targeted community, it is important to collect baseline data and information before and after the project intervention period. For instance, livelihood status, climatic conditions, the number of species including both flora and fauna, greening areas, before and after pictures, and even documentations such as satellite images can all help in building the case for FMNR implementation in the future.
- The chances of FMNR trainings being popular in communities will be increased if FMNR is taught alongside other income generation activities.
- Regular monitoring and coaching sessions are essential to building up relationships and trust among project staff and communities. Without trust and a positive relationship, a project cannot move forward.
- In FMNR forests, valuable tree species should be planted to benefit community incomes, such as traditional medicinal plants, hardwoods, and eco-tourism attractions.
- In Myanmar's CDZ, water is scarce. Constructing small check dams will be helpful for FMNR by providing water and moisture to surrounding areas during the dry season.

Knowledge sharing on land law

- Current and relevant knowledge on laws and policies related to land management and ownership should be shared with target communities, either by external experts or WWF-Myanmar's internal team.
- When selecting land for FMNR implementation, it is critical to have a clear and accurate understanding of the land tenure and ownership status, land use classification and land type. The National Land Use Policy should be thoroughly understood by a target community in order to avoid disputes. It is important

to secure land ownership and land tenure rights for communal forest land before carrying out FMNR.

Scaling up

- The FMNR project or program can be extended to other relevant areas not only in the CDZ, but also in coastal areas where it can be used to restore mangrove forests, and mountainous areas that have suffered deforestation.
- By following a targeted, area-wide greening plan, FMNR can be applied step-by-step through Myanmar's CDZ and beyond, expanding its recognition and accelerating its organic diffusion through farming communities, as was achieved in Niger and other success areas.

10. Annex

The most commonly found tree species found in the study areas are listed in Table 6.

No.	Common Name	Myanmar Name	Scientific Name
1	Cutch	ရှား (Sha)	*Acacia catechu*
2	Indian Mulberry	နီပေဆး(Nipahsei)	*Morinda tinctoria*
3	N/A	သဘ္ဂတ် (Thaput)	*Miliusa velutina*
4	N/A	သန်း (Than)	*Terminalia oliveri*
5	Toddy Palm	ထန်း (Htan)	*Borassus flabellifer*
6	Tropical Chestnut	ေလ့ဗ်ြဖူ(Shaw byu)	*Sterculia versicolor*
7	Persimmon	တည်ပင် (Tae)	*Diospyros burmanica*
8	The Palm Tree	လက်ပံ (Letpan)	*Bombax ceiba*
9	Indian Mahogany	ရင်းမာ (Yinma)	*Chukrasia tabularis*
10	Button tree	ရုံး (Yon)	*Terminalia phillyreifolia*
11	Rain Tree	ကုက္ကို (Kokko)	*Albizzia lebbek*
12	Neem	တမာ (Tamar)	*Azadirachta indica*
13	White-bark Acacia	ထေနာင်း (Tanaung)	*Acacia leucophloea*
14	Jungle Cock Tree	ေဖျာက်ဆိပ် (Phyauk Seik)	*Holoptelea integrifolia*
15	Tamarind	မကျီး (Magyee)	*Tamarindus indica*
16	Eucalypt	ယူကလစ် (Eucalypt)	*Eucalyptus spp.*
17	Dahat Teak	ဒဟတ် (Dahat)	*Tectona hamiltoniana*
18	Ironwood of Burma	ပျဉ်းကတိုး (Pyinkado)	*Xylia dolabriformis*
19	Indian silvergrey wood	လိမ်ပင် (Lim)	*Terminalia bialata*

20	Indian Laural	ေထာက်**ကြီ**(Taukkyan)	*Terminalia tomentosa*
21	N/A	သေဘောက် (Tabauk)	Dalbergia paniculata
22	Kassof Tree	မဲဇလီ (Maezali)	*Cassia siamea*
23	Mesquite/ Honey Locust	**ကန္တာရ** (Gandar-Ya)	*Prosopis juliflora*
24	Gooseberry	ဇီး**ဖြူ**(Zee Phyu)	*Phyllanthus emblica*
25	False Ashoka	ေရတမာ/အာ**သောက** (Ar-thaw-ka)	*Polyalthia longifolia*
26	Jujube	ဇီး (Zi)	*Ziziphus mauritiana*
27	Custard Apple	သြဇာ (Awza)	*Annona reticulata*
28	Falsa	သ**ရော်ကြီး**(Thayaw)	*Grewia acuminata*
29	N/A	သနပ်ခါး (Thanakha)	*Hesperethusa crenulata*
30	N/A	ဇီးမနီ(Zi Ma Ni)	*Hiptage candicans*

Table 6. Tree species found on communal forest and individual farmland in Yenangyaung and Chauk townships

Following discussions with community stakeholders, it is clear that almost all tree species present some kind of value and utility for communities. However, respondents have also highlighted that there are six plant species that are the most preferred for all the communities in the targeted areas. Knowing the local adaptations and utilities of each species is a key to the success of entrenching FMNR in the study areas. The following plant varieties are the most preferred and thus recommended species for FMNR:

- **Cutch**: Wood is durable and strong. The wood is largely used for house construction, agricultural implements such as wheels and tool-handles, and other purposes. It is excellent for fuel.
- **Indian Mulberry**: The wood is used to make chairs, benches and farm implements.
- **Dalbergia paniculata**: Used to make furniture and floorboards. It is also used for firewood.
- **Indian Mahogany**: Due to its strong and durable characteristics, the wood is used as columns and supporting beams for homes. It is also used for firewood. Its flowers are used for traditional medicine.
- **Button tree**: Used in home construction as floorboards, for agricultural implements such as wheels, tool-handles, and other purposes.

Figure 12. The most useful naturally regenerated tree species in the study areas

11. Further reading

MERN, 2014. Project Final Report (Narrative), "Project for Coastal Livelihood and Environmental Assets Restoration in Rakhine (CLEARR)

Rinaudo T., Muller A. and Morris M. 2019 Farmer Managed Natural Regeneration (FMNR) Manual, World Vision Australia.

Weston P.1., Hong R., Kaboré C., and Kull C. A. 2015, "Farmer-managed natural regeneration enhances rural livelihoods in dryland west Africa," Environ Manage, 2015 Jun;55(6):1402-17

World Vision, 2019. Farmer Managed Natural Regeneration, A holistic approach to sustainable development.


WE ARE RESILIENT.
WE ARE WWF-MYANMAR.
Myanmar people are resilient. Picking oneself up and never giving up are important values in Myanmar culture, and as one moves through difficult situations, out of crisis comes innovation.
WWF
Working to sustain the natural world for the benefit of people and wildlife.
together possible
wwf.org.mm
© 1986 Panda symbol WWF - World Wide Fund For Nature (formerly World Wildlife Fund)
© "WWF" is a WWF Registered Trademark. WWF, Avenue du Mont-Blanc, 1196 Gland, Switzerland. Tel. +41 22 364 9111
Fax. +41 22 364 0332 For contact details and further information, please visit our international website at www.panda.org